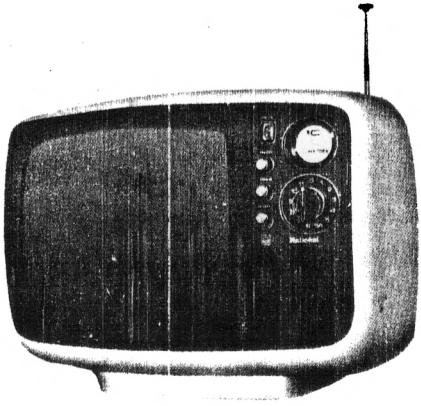
Service Manual

Black and White Television

TR-542DU



Specifications

Power Source:	AC: 240V 50Hz DC: 12V
Power Consumption:	AC: 33W DC: 16W
Antenna:	VHF Monopole Antenna 300ohm Balanced Type
Receiving Channels:	0–11 VHF Australian Standard
Intermediate:	Video: 36.875MHz Sound: 31.375MHz
Semiconductors:	IC: 1(AN240) Transistors: 33 Diodes: 25 High Voltage Rectifier: 1
Picture Tube:	310GUB4 29cm P-Tube 90° Deflection Heater Voltage 12V Heater Current 68mA
Speaker:	12 x 9cm Oval Dynamic Voice Coil 16ohm
Audio Output:	Max. 1.4W
Automatic Controls:	Keyed AGC (Automatic Gain Control) AVR (Automatic Voltage Regulator) Saw-Tooth AFC (Automatic Frequency Control)
Dimensions:	
Height:	31cm
Width:	42.5cm
Depth:	31cm
Weight: (net)	8.2kg
Car Battery Cord:	Built-in (TSX1123-1)

National

Matsushita Electric Trading Co., Ltd.

CAUTION

The high voltage supply at the picture tube anode will give an unpleasant shock, but does not supply enough current to give a fatal burn or shock.
However, secondary human reaction to otherwise harmless shocks have been known to cause injury. Always discharge the picture tube anode to the receiver chassis before handling the tube.
Certain portions of the high voltage generating circuit are dangerous and extreme caution should be observed. The picture tube is highly evacuated and, if brokne, glass fragments will be violently expelled.
WHEN HANDLING THE PICTURE TUBE, ALWAYS WEAR GOGGLES AND PROTECTIVE CLOTHING.

CONTROL LOCATION

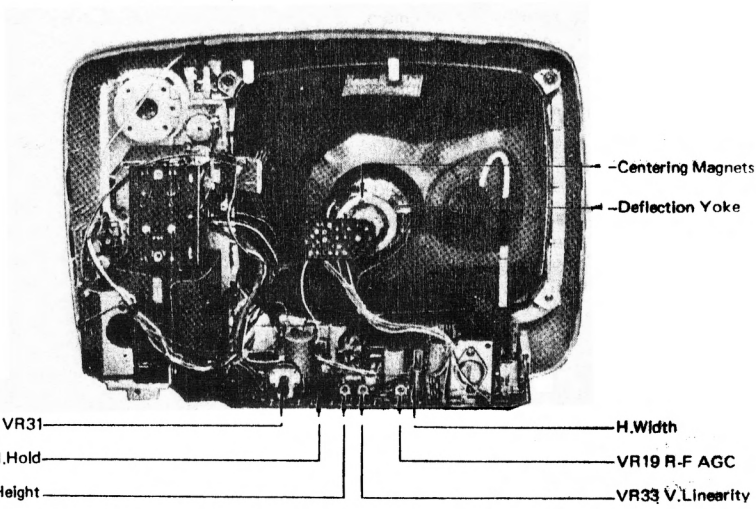


Fig. 1

ADJUSTMENTS

VERTICAL HEIGHT AND VERTICAL LINEARITY (Fig. 1)

(1) These controls VR32 and VR33 should be adjusted simultaneously to give proper vertical size consistent with good vertical linearity.

Adjustment should be made to extend the picture limits approximately 3/16" (5mm) beyond the top and bottom edges of the mask.

AGC (AUTOMATIC GAIN CONTROL)

The adjustment of the AGC control effectively changes the operating point of the AGC amplifier. Turn the I-F AGC control fully clockwise to set for maximum gain. In some areas this may cause clipping of the sync pulses, resulting in a wiggle in the picture and unstable sync. Turning the I-F AGC control counterclockwise direction will decrease the gain of the receiver.

TO ADJUST THE AGC PROPERLY (Fig. 1 and Fig. 2)

1) Set the channel selector to a station transmitting a strong signal.
2) Set the R-F AGC control VR19 to the center position.
3) Turn the I-F AGC control VR18 fully counterclockwise, and the contrast and brightness controls fully clockwise.
4) Adjust the I-F AGC control VR18 to obtain a sharp and clear picture. If I-F AGC control VR18 is turned fully clockwise, the input signal strength will be maximum.
5) Observing the input signal, turn the R-F AGC control VR19 clockwise or counterclockwise to the point where the snow noise disappears in the picture.
6) Check the reception on all channels. There should be no wiggling. Make certain the picture does not disappear when the contrast controls is turned to minimum.
7) Readjust R-F AGC control slightly, if necessary. In very strong signal areas, where slight sync clipping is still evident, shorten antenna length to reduce sensitivity of the set.

AVR (AUTOMATIC VOLTAGE REGULATOR) (Fig. 3)

Connect a Volt meter across B + supply line and chassis. Next make certain B + supply voltage in +11.5V by adjusting the AVR control (VR71).

YOKE POSITION (Fig. 4)

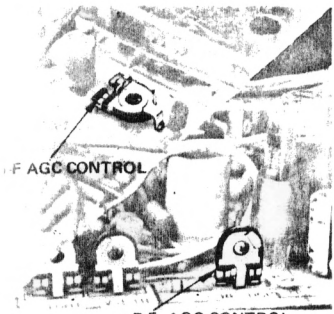
The yoke is secured to the neck of the picture tube with a clamp and screw. To adjust the yoke and correct for picture tilt, loosen this clamp. Correct tilt and retighten the screw.

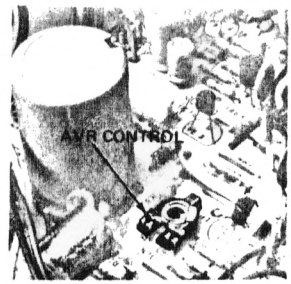
CENTERING (Fig. 4)

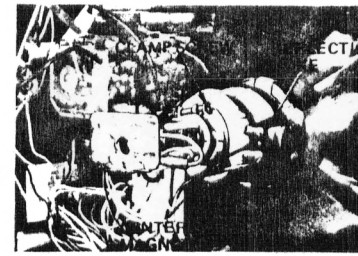
The picture centering device consists of two rings located at the rear of the yoke assembly. Each ring has a tab for ease of adjustment. The tabs should be rotated and moved towards or away from each other until the picture is properly centered on the screen of the picture tube.

HORIZONTAL WIDTH (Fig. 1)

Adjust the slug of coil to extend the picture about 13mm beyond the mask with the brightness control set to normal operating position.







DISASSEMBLY INSTRUCTION

REAR COVER REMOVAL

(1) Remove 3 screws A and 4 screws B from the rear cover. (See Fig. 5 and 6)

MAIN PRINTED CIRCUIT BOARD REMOVAL

(1) Remove the rear cover.
(2) Disconnect the anode cap, the picture tube socket and the wires, and then pull the main printer circuit board forward.

FEATHER-TOUCH SWITCH CIRCUIT BOARD COMPLETE REMOVAL

(1) Remove the rear cover.
(2) Remove 1 screw C then pull it forward. (See Fig. 7 and 8)

TUNER BLOCK REMOVAL

(1) Remove the rear cover, the channel knobs, and the control knobs.
(2) Remove the power source block.
(3) Remove 4 screws D (See Fig. 8)

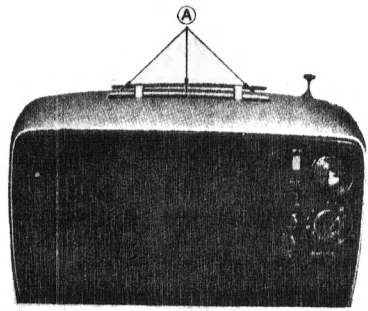


Fig.5

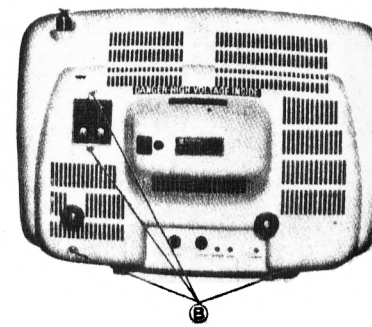


Fig. 6

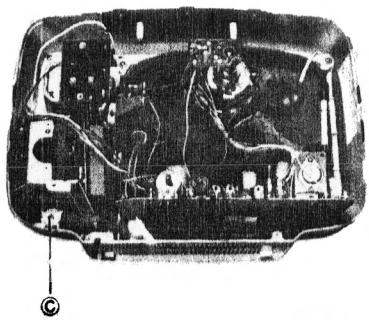


Fig. 7

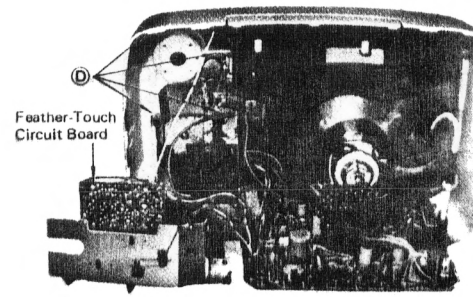


Fig. 8

VIDEO I-F ALIGNMENT

EQUIPMENT CONNECTION

Disconnect the jumper lead (J104) and (J101) See Fig. 9.

Power Supply . . . . . Supply DC + 11.5V to TP91. See Fig. 9.
Supply DC + 3.7V to TP12. See Fig. 9.

Oscilloscope, Sweep Generator. . . . . Connect as shwon in Fig. 9.

Marker Generator
Couple loosely to the output lead of the sweep generator.

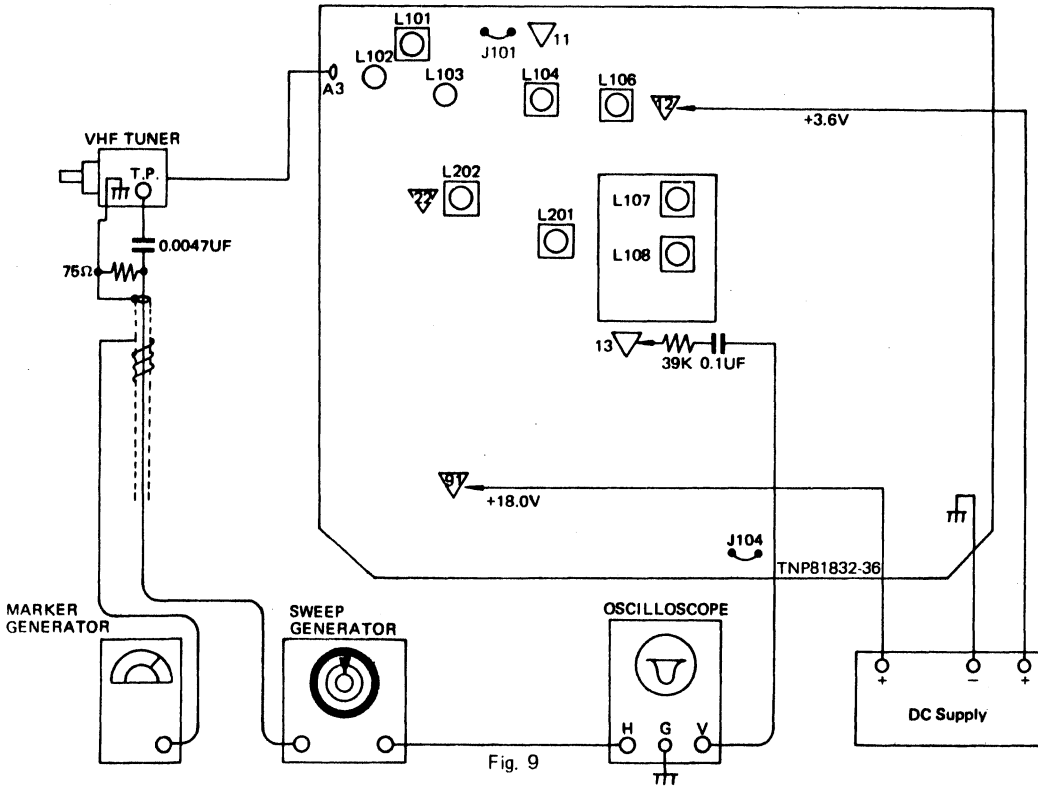


Fig. 9

ALIGNMENT

STEP	ALIGNMENT	WAVEFORM
1	Adjust both L104 and L106 to the maximum gain at 34.625 MHz. marker position.	
2	Adjust both L107 and L108 to obtain the correct response curve as shown in Fig. 10.	
3	Adjust L103 to the minimum gain at 38.375 MHz. marker position as shown in Fig. 10.	
4	Adjust both L101 and Tuner Convertor coil to obtain the correct response curve as shown in Fig. 10.	

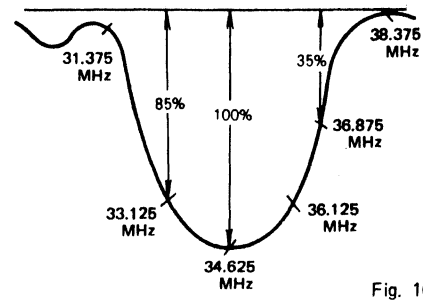


Fig. 10

SOUND I-F ALIGNMENT

EQUIPMENT CONNECTION

Disconnect the jumper lead (J104) and set the power switch to "ON" position. See Fig. 11.

Marker Generator

Couple loosely to the output lead of the sweep generator.

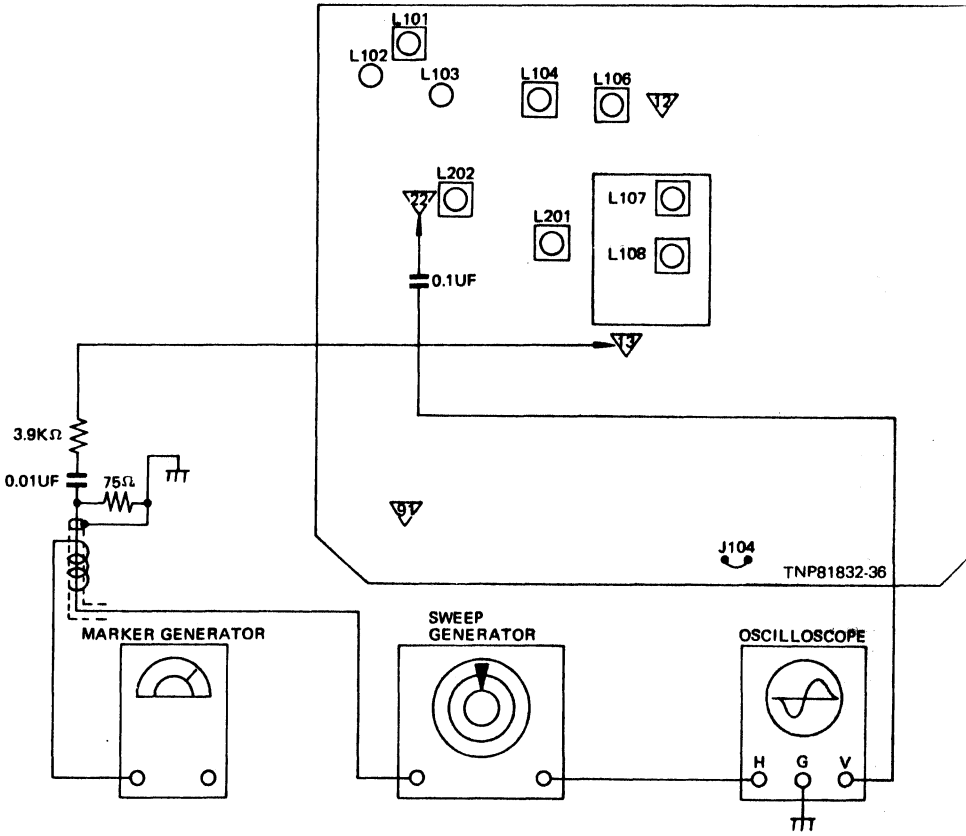


Fig. 11

ALIGNMENT

STEP	ALIGNMENT	WAVEFORM
1	Adjust both L201 and L202 to the maximum gain at 5.5MHz. marker position as shown in Fig. 12.	
2	Adjust L202 until the 5.5MHz. marker is at the center of slanted line as shown in Fig. 13.	

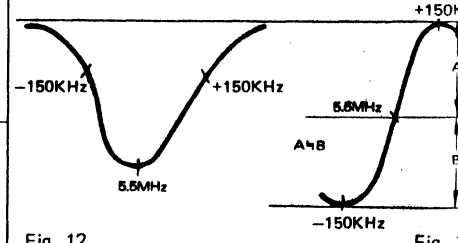
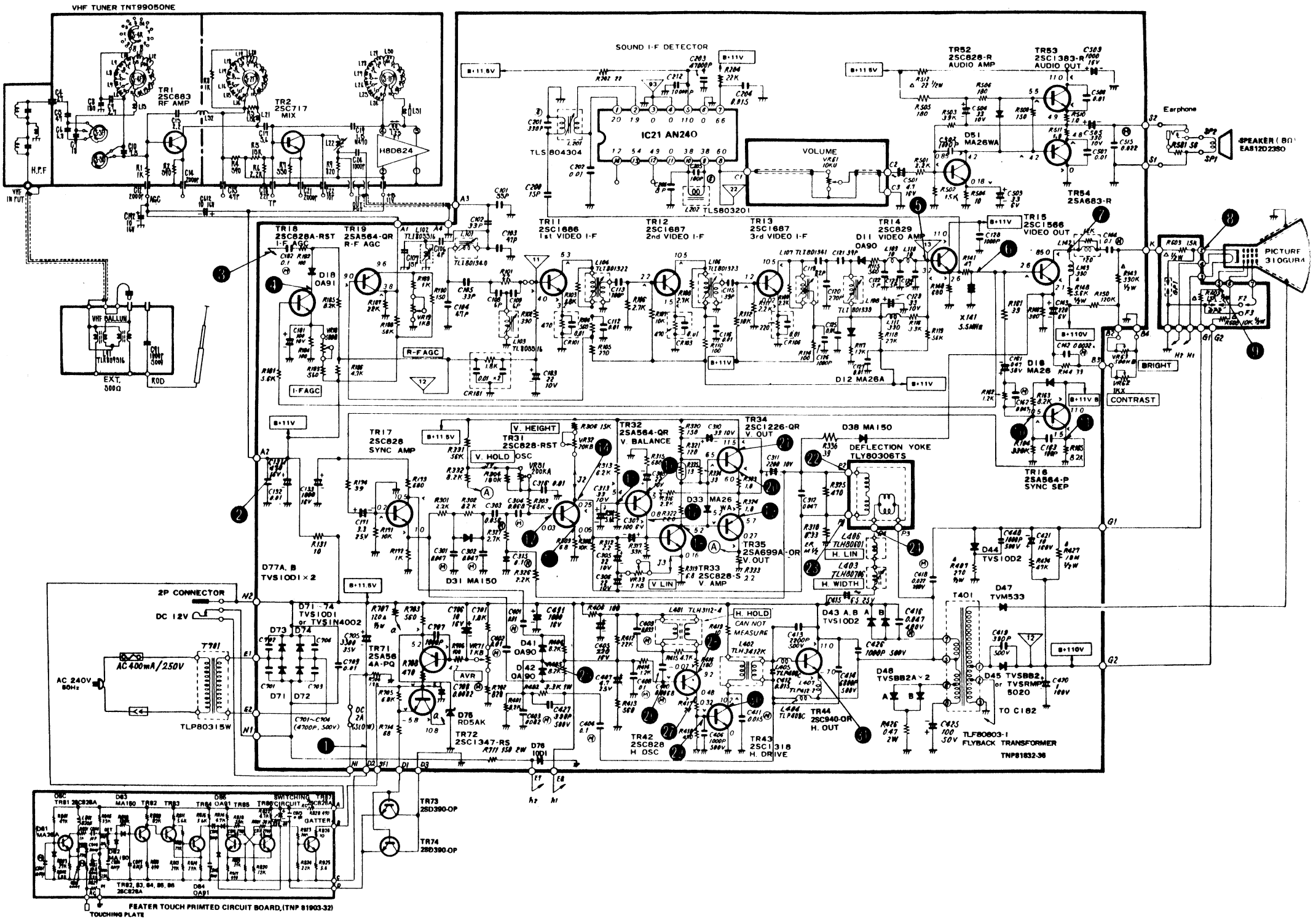
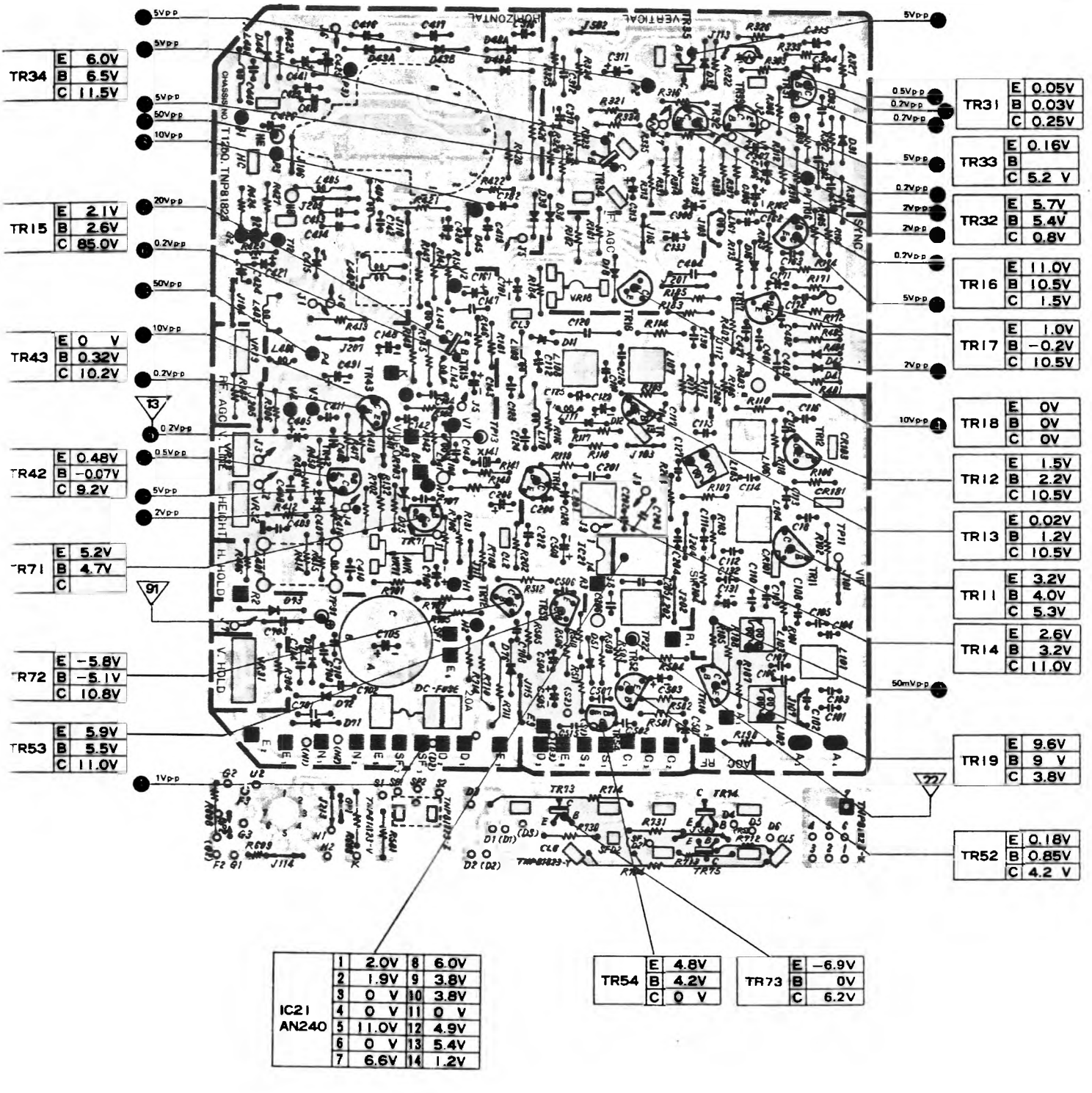


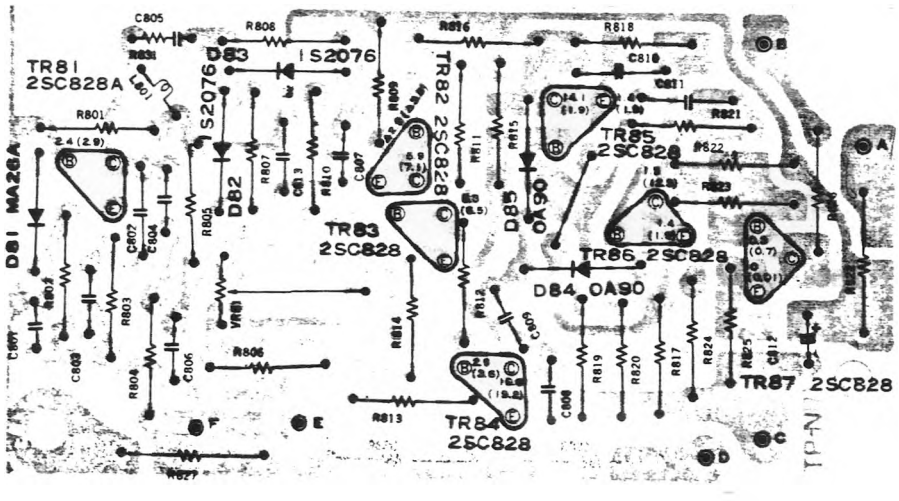
Fig. 12 Fig. 13


VHF TUNER TNT99050NE
TR1 2SC683 RF AMP
TR2 2SC717 MIX
H8D624
SOUND I-F DETECTOR
IC21 AN240
TLS804304
TLS803201
VOLUME
TR52 2SC828-R AUDIO AMP
TR53 2SC1383-R AUDIO OUT
Earphone
SPEAKER (8Ω)
EAS12D23S0
D51 MA26WA
TR54 2SA683-R
TR11 2SC1666 1st VIDEO I-F
TR12 2SC1687 2nd VIDEO I-F
TR13 2SC1687 3rd VIDEO I-F
TR14 2SC829 VIDEO AMP
D11 OA90
TR15 2SC1566 VIDEO OUT
X141 3.58MHz
PICTURE 310GUR4
TR18 2SC828A-RST I-F AGC
TR19 2SA564-QR R-F AGC
D18 OA91
R-FAGC
I-FAGC
D12 MA26A
D18 MA26
BRIGHT
CONTRAST
TR17 2SC828 SYNC AMP
TR31 2SC828-RST
V. HEIGHT
V. HOLD OSC
TR32 2SA564-QR V. BALANCE
TR34 2SC1226-QR V. OUT
D38 MA150
DEFLECTION YOKE TLY80306TS
TR16 2SA564-P SYNC SEP
D33 MA26
TR35 2SA699A-QR V. OUT
TR33 2SC828-S V AMP
V. LIN
H. LIN
H. WIDTH
H. HOLD
CAN NOT MEASURE
D31 MA150
D77A, B TVS10D1×2
2P CONNECTOR
DC 12V
AC 240V 50Hz
AC 400mA/250V
T701
TLP80315W
D71 - 74 TVS10D1 or TVS1N4002
D71 D72 D73 D74
TR71 2SA56 4A-PQ
AVR
D75 RD5AK
TR72 2SC1347-RS
D41 OA90
D42 OA90
TR42 2SC828 H. OSC
TR43 2SC1318 H. DRIVE
TR44 2SC940-QR H. OUT
D43 A, B TVS10D2
D44 TVS10D2
D47 TVM533
D48 TVS882A×2
D45 TVS882 or TVSRMP 5020
T401
TO C182
TLF80803-1 FLYBACK TRANSFORMER
TNP81832-36
D76 10D1
TR73 2SD390-OP
TR74 2SD390-OP
SWITCHING CIRCUIT
FEATER TOUCH PRIMTED CIRCUIT BOARD,(TNP 81903-32)
TOUCHING PLATE
EXT. 300Ω
ROD

CONDUCTOR VIEW (Fig. 16)

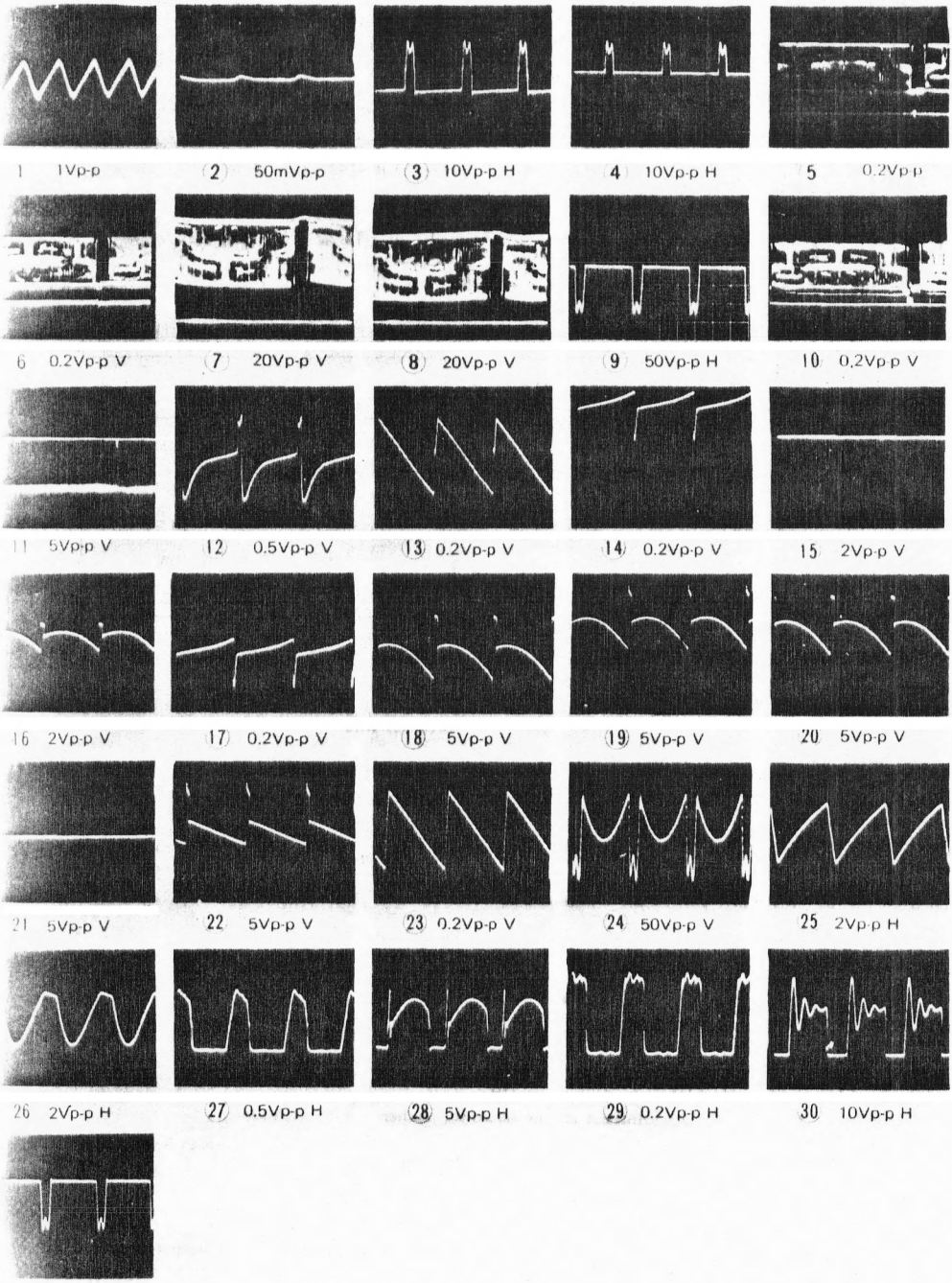


CONDUCTOR VIEW

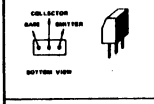
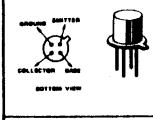
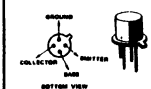
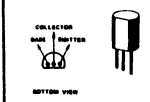
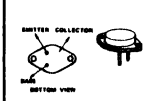
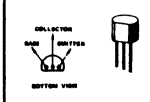
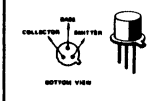
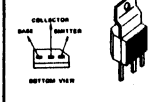
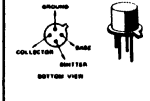
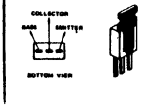


WAVEFPRM PATTERM

ese waveforms were taken with VHF signal.
e peak to peak voltage were measured setting brightness and contrast
ntrols at maximum.



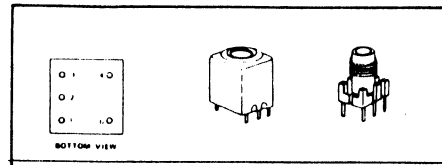
TRANSISTOR BASE INFORMATION

	2SC761
	2SC683
	2SC761 2SC948
	2SA683 2SA751 2SC1383
	2SC901A
	2SA564A 2SC564A 2SC828A 2SC829 2SC1215 2SC1318
	2SC1012
	2SA699 2SC1226
	2SC562 2SC563
	2SD389

NOTE

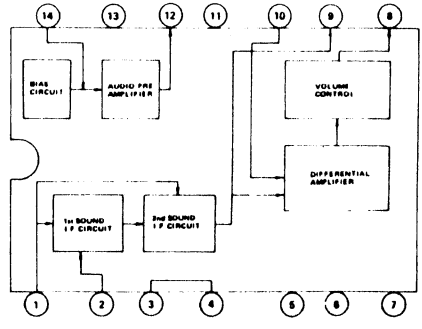
1. RESISTOR
   All resistors are carbon 1/4W resistor, unless otherwise noted the following marks
   Unit of resistance is OHM (Ω) (K=1,000, M=1,000,000)
   - △ : Solid resistor
   - ● : Metal oxide resistor
   - ▯ : Wire wound resistor
   - : Thermistor
   - : Fuse resistor
2. CAPACITOR
   All capacitors are ceramic 50V capacitor, unless otherwise noted the following marks
   Unit of capacitance is μF, unless otherwise noted
   - (M) : Polyester capacitor
   - (S) : Polystylene capacitor
   - : Electrolytic capacitor
3. COIL
   Unit of inductance is μH.
4. TEST POINT
   - : Test point position
5. VOLTAGE MEASUREMENT
   Voltage is measured by a volt ohm meter with DC 20K OHM/V receiving normal signal, when all controls are set to the maximum position.
6. Number in red circle indicates waveform number
7. When arrow mark (↗) is found, connection is easily found along with the direction of an arrow
8. When schematic diagram of a board is described in more than two places, they are encircled with dotted line ( )
9. This schematic diagram is the latest at the time of printing and subject to change without notice

TRANSFORMER TERMINAL INFORMATION



L101 L104 L106 L107 L108
L201 L202

IC21 AN240



FEATHER TOUCH BUTTON CIRCUIT

A non-contact switch which actuation is electronically effected has newly been developed as the power source switch for television sets and this switch is adopted as a new device (feather touch button) in this television set.

This device consists of the following circuit which serves for an entirely new switching system for power source of television sets, that is "on" and "off" operation can be effected by touching with finger tip the feather touch button provided on the front side of a television set.

SCHEMATIC DIAGRAM FOR FEATHER TOUCH BUTTON CIRCUIT BOARD (TNP81903-32)

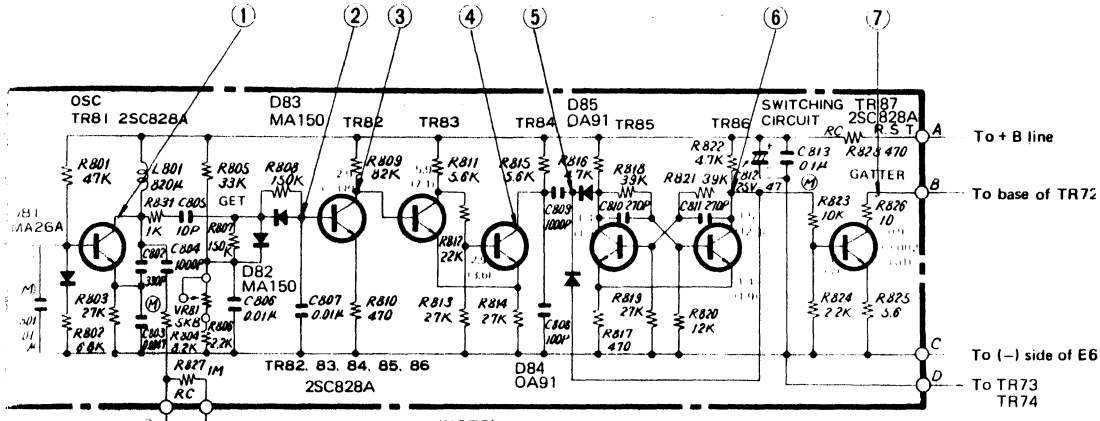


Fig. 13

(NOTE)
AS FOR ONLY THE VOLTAGE VALUES INDICATED ON THE FEATHER TOUCH CIRCUIT, THE VOLTAGE OF EACH POSITION ARE MEASURED WHEN THE C TERMINAL IS GROUNDED, AND VOLTAGE VALUES INDICATED WITHIN ( ) ARE MEASURED WHEN SWITCH IS OFF.

OPERATING PRINCIPLE

Colpitts oscillation is used for oscillation circuit and the oscillating signal of about 300 KHz is produced for the collector of TR81. When the finger tip of a man touches the plate of feather touch button ($t_1 - t_2$ $t_3 - t_4$), the amplitude of oscillating signal will be reduced due to the negative feedback by the capacity (capacity of human body to ground: about 35 pF) which is caused by the touch of finger tip and thus the oscillating signal of the collector (point ① in wiring diagram) of TR81 produce the waveform a.

The oscillating signal which amplitude is varied will be converted into DC voltage through detection circuit. However, detection output voltage is increased by means of voltage detector (D82 and D83) then the detection output voltage is combined with the DC voltage bled from R805 and VR81 thereby obtaining (waveform b) for detection output (point ② in wiring diagram).
The incline of curve to represent the variation (rise) in detection output will not be steep due to the charging and discharging of C805 and C807 thereby generating inclined wave form.

Detection output voltage is amplified by the amplifier transistor TR82 and the collector (point ③ in wiring diagram) of TR82 shows the waveform having relatively steep incline.

However, in order to actuate the flip-flop circuit which belongs to later stage, square waves are needed. For this reason, when the voltage (waveform c) is amplified by the feedback circuit for emitter connection of transistors TR83 and TR84 for wave form shaping, (waveform b) is obtained.

As for flip-flop circuit, the base resistances R819 and R818 of transistors TR85 and TR86 are changed then TR85 is kept continued while TR86 is kept discontunued under normal condition. When, under such condition, the voltage (waveform d) is supplied to C809, differentiated trigger pulse (waveform e) will be produced on the output side of (point ⑤ in wiring diagram) C809 and only negative pulses will be supplied to the collector of TR85 and TR86 through diodes D84 and D85. However, since TR85 is kept continued, the collector is free from the influence of pulses whereas the pulses which cannot pass through the collector because of TR86 which is kept discontinued reaches the base of TR85 through C811. Thus, the base current and collector current being to decrease and they will finally be discontinued thereby bringing TR86 into continued condition. The original condition will be restored when pulse (t_3) is supplied. Hence, (waveform f) is obtained as for the collector (point 6 in wiring diagram) of TR86

6. When voltage (waveform f) is supplied to the base of gate transistor TR87, collector (point (7) in wiring diagram) produces amplified (waveform g). Through the foregoings, operating principle of the circuit for electronic switch is explained.
7. The voltage (waveform g) which is produced through the circuit for feather touch button is supplied to the base of amplifier transistor TR72 is AVR circuit. Thus, the variation in voltage (waveform g) caused by the touch of finger tip on the plate of feather touch button actuates AVR circuit then "on" and "off" operation of power source switch for a television set can be effected.

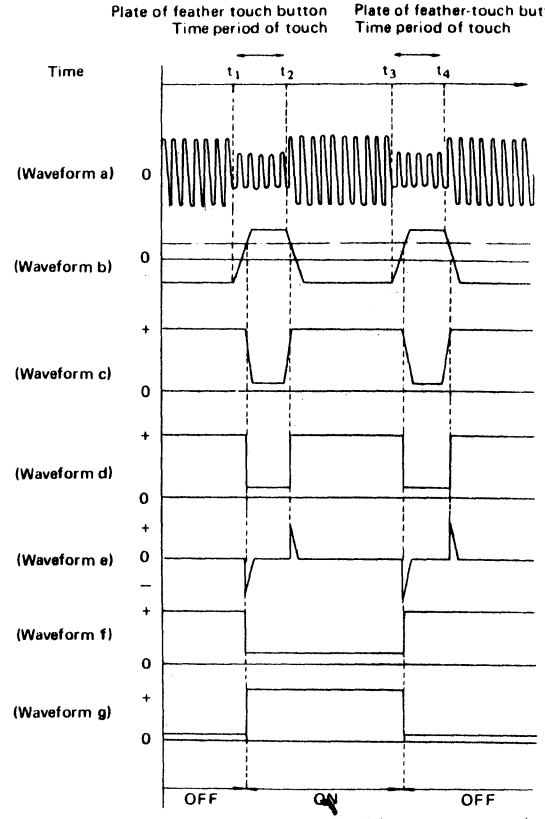


Fig. 14

ADJUSTMENT OF VARIABLE RESISTOR

1. Remove circuit board for feather touch button from its holder. (To remove the board, unscrew four machine screws which are provided to fix the board.)
2. Remove the lead wire (pink-colored) to the printed for feather touch button from Ⓕ terminal.
3. Connect a capacitor of 30 pF ± 1% between Ⓕ terminal of circuit board for feather touch button and ground on the reverse side of circuit board.
4. Insert the plug of power source cord of television set into the socket outlet of AC current then touch with finger tip Ⓕ terminal to bring the switch into "on" position.
5. Turn variable resistor VR81 to bring the base voltage (detection output voltage) of TR82 to 0.4 V (±0.05V).
6. Confirm that ON-OFF operation for television set can be effected without fail by touch of finger tip on the plate of feather touch button provided on the front side of the television set.

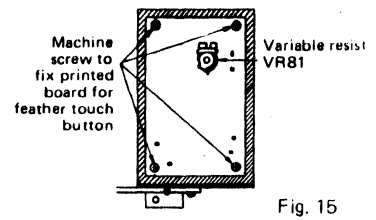
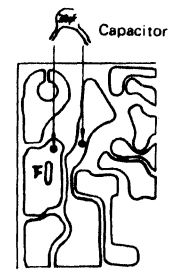


Fig. 15

Fixed printed board for feather touch butt
viewed from above



Position of capacitors

Fig. 16

(NOTE)

When to connect the capacitor indicated in item 3 of the above instructions for adjustment without removing the circuit board for feather touch button a capacitor of 26pF (±1 %) should be used taking into consideration he idle capacity(4pF).

The voltmeter to be used for adjustment should have high input impedance (over 10 MΩ).

SERVICING FOR FEATHER TOUCH BUTTON CIRCUIT

1. Operating condition and voltage for each of transistors within feather touch button circuit.
When to instect the feather touch button circuit, reger to the following table. As for the circuits after TR85(flip-flop), the operating conditions under both "On" and "Off" conditions are indicated since the operating conditions varies according to whether or not the plate of feather touch buttons touched.

Oscillation circuit waveform shaping circuit

Conditions \ Items \ Transistors		TR81	TR82	TR83	TR84
Touched	Operating condition	ON	ON	OFF	OFF
	Voltage of collector at ON/OFF positions	16.4V/18.4V	0.4V/0.2V	14.3V/17.8V	5.6V/7.0V
Not touched	Operating condition	ON	OFF	ON	OFF
	Voltage of collector at ON/OFF positions	16.4V/18.4V	6.0V/7.4V	5.4V/6.7V	16.5V/18.3V

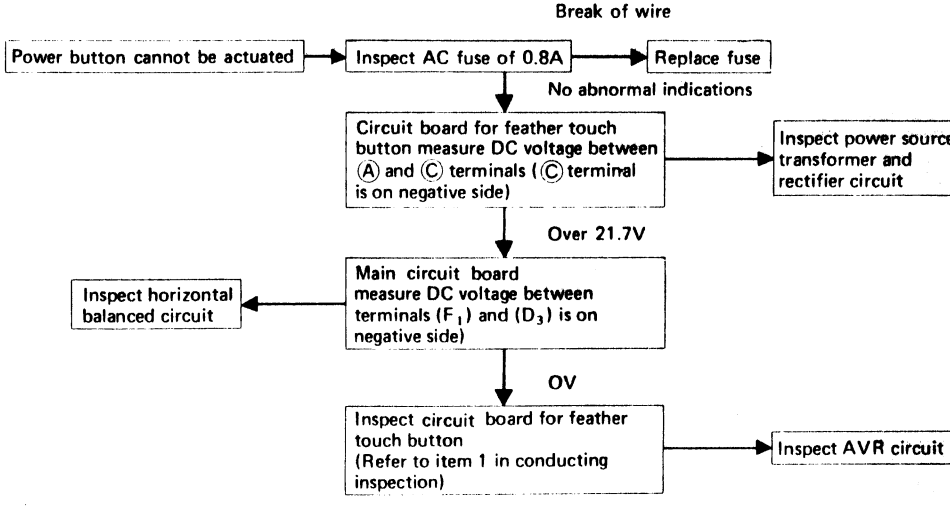
Flip-flop circuit gate circuit

Conditions \ Items \ Transistors		TR85	TR86	TR87	AVR TR61, 62
OFF	Operating condition	ON	OFF	ON	OFF
	Voltage of collector	2.0V	13.5V	0.1V	18.5V
ON	Operating condition	OFF	ON	OFF	ON
	Voltage of collector	14.8V	1.6V	0.3V	7.8V

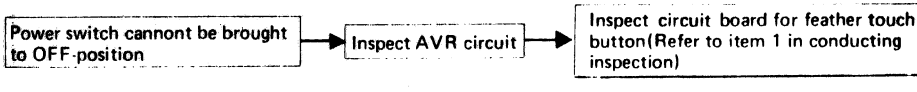
Value of voltage is measured with a vacuum tube voltmeter using C terminal as the standard (−)

2. Inspection procedure

Power button cannot be actuated (OFF position)


Break of wire
Power button cannot be actuated
Inspect AC fuse of 0.8A
Replace fuse
No abnormal indications
Circuit board for feather touch button measure DC voltage between Ⓐ and Ⓒ terminals (Ⓒ terminal is on negative side)
Inspect power source transformer and rectifier circuit
Over 21.7V
Main circuit board measure DC voltage between terminals (F_1) and (D_3) is on negative side)
Inspect horizontal balanced circuit
OV
Inspect circuit board for feather touch button (Refer to item 1 in conducting inspection)
Inspect AVR circuit

Power button cannot be brought to OFF position (ON condition)


Power switch cannont be brought to OFF-position
Inspect AVR circuit
Inspect circuit board for feather touch button(Refer to item 1 in conducting inspection)